, STRUCTURE IN THE SOLAR C ORONA INFERRED FROM RADIO SCATTER IING MEASUREM ENTS

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For over four decades, electron density irregularities in the solar corona have been investiga ted with scattering measuren ients using natural radio Sources as well as spa cecraft radio signals as they passed behind the Sun. Examples of these measurements include angular broadening, phase/Doppler scintillation and spectral broadening.

Despite the success in establishing many propertie s of the density irregularities, the nature of the irregularities and their relatioi iship to solar features have not been fully understood. For example, two notable chara cteristics of the density irregularities have remained unexplained. The first is the abrupt rise in anisotropy of the density irregularities inferred from angular broadening measurei n en ts nea r the Sun, especially when conducted with lo n ger baseline interferometers. The second is the break near 1 Hz in the inverse power-law density spectrum inferred from phase scintillation and spectral broadening mea surements. For frequencies lower than the break, the density spectrum is Kol n iogorov (spectral index of 5/3), while for frequencies that are higher, the spectrum is flatter (spectal index nea r 1),

Ill this paper, we show that these characteristics can be interpreted in terms Of a corona that is permeated by a hierarchy Of ra y- lik e St] U(.till'(V~ with the smallest size being about 1 Ii Ill at the Sun. Within these st1 uctues, the density variations are represented by random irregularities that are convected along with the solar wind. The en erging picture of a corona that is highly structured unifies results from widely varying radio propagation measurements, and demonstrates how st ructures observed in whit e-light are related to those in the radio propagatic m measurements.

Abstract Submission Form

1996 National Radio Science Meeting

Reference # 0000
Session 0.00

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Date received: 23 May 95
Date for matted: September 28, 1995
Form version: 1 .0